The Ohio Academy of Science
Forty-Sixth Annual
Field Conference
April 24, 1971
The University of Akron

GUIDE TO THE FORTY-SIXTH

ANNUAL FIELD CONFERENCE

of the

GEOLOGY SECTION

of the

OHIO ACADEMY OF SCIENCE

April 24, 1971

GEOLOGY AND THE SUBURBAN-URBAN

LANDUSE IN PORTIONS OF SUMMIT,

PORTAGE AND STARK COUNTIES, OHIO

Vice President, Section C

John Hall

Case-Western Reserve University

Guidebook

Jim L. Jackson-Geology

Thomas Nash-Geography

Field Conference Leaders

Thomas Nash - The University of Akron

James Rinier - Kent State University

Jim L. Jackson - The University of Akron

46th Annual Meeting

The University of Akron

Arthur E. Burford, Chairman

Department of Geology

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INTRODUCTION

The Ohio Academy of Science last met at The University of Akron in 1958. At that time, the Field Conference featured the classic Pennsylvanian-Mississippian contact in the Gorge Metropolitan Park and the stratigraphy readily visible north down the Cuyahoga River Valley. Glenn Frank was the trip leader.

This year the conference features the Pleistocene deposits, soils, landuse and Pennsylvanian Stratigraphy southeast of Akron. Many papers, State Bulletins, and other sources provide considerable information about the geology of the Akron area. There was no single source of general information about the geology of Northeastern Ohio until the Fall of 1970.

The Northern Ohio Geological Society (NOGS) recognized the need for a general description of the geology of Northeastern Ohio. NOGS met that need with the publication by the society of the volume:

> Guide to the Geology of Northeastern Ohio, 1970
> Edited by P.O. Banks and R.M. Feldmann.
> Copies are available at $4.00 a copy (just over cost).
> Contact Dr. Barry Miller, Geology Dept., Kent State University, Kent, Ohio 44240.

Avid field trippers are also reminded of the volume:

> Ohio Intercollegiate Field Trip Guides 1950-1951 - 1969-1970
> that is available from Glenn Frank for $5.00 plus 50¢ for handling and postage.
> K. S. U. Geology Department.

The above two volumes are highly recommended reading. Geology of Stark County, Bulletin 61, of the Ohio Geological Survey by Dick DeLong and George White is also an excellent source of information. End of commercials!

Please exercise caution when crossing highways and remain clear of highwalls. Property owners willing to allow us to use their land for educational purposes are appreciated and neither they nor your trip leaders want a new crop of grey hair.

This year's conference leaders intend to present evidence in Summit, Portage and Stark Counties that shows the close relationship between geology and intelligent use of the land. There is no intent to imply that all geologists should jump on the environmental bandwagon. The conference leaders and probably every geologist on the trip have been aware of the strong ties between geology and the use of natural resources from the topsoil down for many years.

Chartered buses are being used to allow for more dialogue. They may further help reduce possible inclement weather problems, and the usual safety hazards of highway geology.

Special thanks is given to Kevan Gaug for graphs, maps and diagrams that he prepared for this guidebook. Dr. Richard DeLong provided a portion of the economic geology information. The extensive work in this area of Dr. George White has been most helpful. His permission to use some of his data is appreciated.

Two soil scientists, R. L. Christman and J. R. Bauder helped arrange for the field stops. Their presence today will be most helpful.

AN OVERVIEW OF THE PLEISTOCENE STRATIGRAPHY IN SUMMIT, PORTAGE AND STARK COUNTIES

Jim L. Jackson

Glacial drift is a wide variety of surficial materials. The variations in the average grain size of $\longrightarrow$ permeability of $\longrightarrow$ soils developed on $\longrightarrow$ and potential use by man between outwash, till, loess and glacial lacustrine deposits are recognized worldwide. The Akron area Pleistocene deposits include outwash, lacustrine material and several different tills that are lithologically different one from the other. Hence, the Akron area has a wide variety of soils and a rather complex glacial stratigraphy.

As glacier ice moved southward from what is now Canada during the ice age, the bulk of the ice was deflected by the escarpment marking the northwest boundary of the Appalachian Plateau and pancaked outward into central Ohio. Northeastern Ohio probably had thinner ice cover and more "patchy" or irregular glacial deposits than did central Ohio. A Pre-Illinoian stream valley in the present Grand River area, and similar "low" areas west of Akron permitted the major ice invasions of northeast Ohio. These invasions of Wisconsin ice are referred to as the Grand River Lobe and the Killbuck Lobe respectively. Several different advances of the ice occurred developing a stratigraphy of varying tills in these lobes. (See page 13).

The thickness of the glacial drift is directly related to the preglacial topography. Preglacial valleys have been filled with glacial drift. The buried valleys may have several hundred feet of interbedded outwash, till, lacustrine and occasionally loess deposits. Some topographic highs are actually bedrock exposures and have no till on them. Because of increasing demands for water coupled with extensive areas of shale bedrock and clayey till or lacustrine deposits, the sand and gravel deposits of the buried valleys are important sources of groundwater.

Smith and White reported in 1953 that Goodyear Tire and Rubber Company was pumping 4.5 million gallons of water per day from their well field in east Akron just up valley from Stop 1 of this field trip. The pumping is seasonal totalling about 970,000,000 gallons each year. Though this buried valley type aquifer is not the largest in the area, figures "show that about 600,000,000 gallons a year infiltrates to the aquifer from the Little Cuyahoga River" which has partially exhumed the buried valley. (Smith and White, 1953).

The oldest glacial material in the immediate Akron area is found in the buried valleys. Generally the older tills are found on the surface along the southern margins of the Grand River and Killbuck Lobes. George W. White (1969) has suggested age relationship for the tills. (See pages 13 and 14).

The late V.C. Shepps showed that there is a decrease in the mean grain size in the Mogadore through the Hiram tills. Sandy-silty till (Kent) results in a much more permeable material than the more clayey Hiram till. Note the diagrams on page 17. The Titusville (Mogadore) till is sandy with an average of the sample means equal to 0.072 mm. Kent till is silty with an average of sample means of 0.018 mm. Hiram till is a silty to clayey till with an average of sample means equal to 0.0066 mm. (Shepps, 1953). Soil characteristics vary from one till to another though other factors such as topography are equivalent.

White states in the Geology of Stark County sand size fragments in the tills of northeastern Ohio are 55-85% quartz, 12-40% feldspar, 2-10% carbonates, and 1% other minerals. Younger tills have more feldspar and carbonates and less quartz than the older tills. "The clay minerals in the tills are mainly illite and chlorite; the older tills also contain kaolinite." (White, 1963, page 123).

The older tills are more deeply weathered and leached except where decapitated buried soil profiles are found in cuts. The Mogadore till and Titusville tills are thicker than many portions of the Kent till. The topography of the Brimfield, Suffield and Hartville area leaves no question of the term kame moraine being appropriate for the deposits of sand and gravel found there. However, the Kent till is "generally less than 10 ft. thick, ..." (White, 1969). Much of the kame moraine topography that is viewed on this trip is due to underlying kames and kettles of earlier till sheets. The Kent kame moraine is therefore only partially Kent till.

The thinness of the outer margins of the till sheets has not been consistently emphasized. Further the boundaries between two different tills are probably seldom sharp. The edges of the till sheets are ragged or patchy. Windows exposing older tills are common. The detailed soils map, page 16 , illustrates the extreme patchiness of surficial deposits.

Mr. Byron Jodar completed a map of the surficial deposits of Summit, Stark and Portage Counties as a project for the Vegetation and Soils class. He used recent soil data (1968-1970), particularly the generalized county maps and soil associations to suggest boundaries of differing tills. His map is on page 15 . (Jim Jackson must bear the responsibility for the Illinoian till shown west of the Tuscarawas River. When previous glacial maps are ignored, the soils data suggest that windows exposing Illinoian till may be west of the Tuscarawas River).

Mr. Jodar found some problems, but the following drift-soil associations are offered for further study.

Drift	Soil Association
Hiram Till	Mahoning-Ellsworth-Remsen-Trumbull
Lavery-Hayesville Till	Wadsworth-Rittman
Kent-Navarre Till	Canfield-Ravenna-Wooster
Mapledale Till	Loudonville-Wooster
Undifferentiated Outwash	Chili-Wheeling-Shoals.-Chili and Chagrin-Wayland and Sebring-Fitchville-Caneadea

SOME CONSIDERATIONS OF SOILS IN REGIONAL LAND USE PLANNING

Thomas Nash

The increasing complexity of metropolitan regions has been paralleled only by the complexity of the disciplines, both theoretical and applied, which are called upon to contribute their approaches and understandings toward the solution of urban problems. The physical geographer, the geologist, and the soil scientist should be colleagues, and share in a common concern for the problems of man in the expanding urban environment.

Topography, surface water, ground water, subsurface materials, and soils all play significant roles in shaping the pattern of development. This part of the Guide focuses attention on soils and some of their planning implications.

The Need for Soils Information

Since the second world war there has been what is called by some people "the flight to the suburbs". People by the thousands have been trying to escape the ills of the central city. Many people believed all that was needed was to locate a lot outside the city, build a house, and their problems would be over. The result was instead a whole new series of problems of which few persons had ever dreamed. E.g., a house could not just be built and automatically "hooked up" to sewer lines, water, etc. Even in some places where water and sewer facilities were available, there were other problems. Many unsuspecting and frustated home site purchasers found themselves helplessly entangled in a maze of physical, mechanical, financial and even legal problems originating from adverse soil conditions. Such situations extended from the unstable organic bogs of the Atlantic Coastal Plains to "Heartbreak hills" in Southern California. Oh, but you say that was 20 some years ago! The sad truth is that even today the very same situation is occurring.

Examples of problems resulting from development incompatible with soil conditions include, (1) flooded basements, (2) cracked walls and foundations of buildings, (3) roads that have buckled or caved in, (4) septic tanks operating inefficiently or not at all, (5) ground water contamination by septic tank effluent, (6) serious erosion and land slides, and (7) shortened life of underground utility installations caused by corrosive action.

Many mistakes in decision making have been made because people assume that soils that look alike behave alike, but this is not always true. As a result of the lack of knowledge of soil conditions, planners, developers and even engineers tend to either: (1) ignore the subject, or (2) overrate the complexities of soils. In the first case, serious maintenance problems related to under-design result, while in the second case, over-design tends to prevail. Either way, costs go up. Such examples add meaning to the following general planning questions: (1) What is the suitability of land for development? and (2) What use should be made of the land? Planners must ask not only what use, but what best use should be made and how should these uses fit together to produce a "good" environment? Since soil is the base on which we build and is an ever-present construction material, it is essential to know its potentials and limitations, i.e., soil conditions.

Engineering Soils Data

There are many engineering soil classification systems in use that consist of a self-descriptive mapping unit which gives an appraisal of the soil by factors which bear directly upon a specific question. Most efforts to formulate such systems have concentrated on a laboratory classification, where soils are differentiated on the basis of their textural properties. With the laboratory classification it is necessary to correlate test data with field performance. Such procedures are expensive and the tests are performed on the soils in an unnatural state removed from their normal environment. Such soil data is not universally adaptable for planning because soils with near identical laboratory classification may react quite differently in the field when subject to intensive use.

It may be said that engineering soil studies (1) have been directed principally at single problems and situations, (2) are expensive to utilize, (3) are limited in their coverage, and (4) do not take into consideration environmental conditions. This type of consideration is of particular significance in Northeastern Ohio in terms of frost penetration and the wide seasonal variation of subgrade bearing value.

An important objective for any soil classification for regional planning purposes is to eliminate expensive laboratory testing and yet provide as much pertinent information as is possible. Pedological soil classification which takes into account in-place conditions of parent material, topographic position, internal drainage, and profile development, can provide the planner with a system which meets the stated objective.

How Soil Surveys Can Be Used in Regional Planning

The soil inventories can be interpreted for many purposes because they describe soils in great detail. From the standard 1"-660' detailed field sheets of the Soil Conservation Service and the Ohio Department of Natural Resources, separate maps can be produced to indicate only one soil characteristic, e.g., relief, drainage, water table conditions, texture, stoniness, or permeability. Such single-function maps can be related to the suitability of soils for specific uses, i.e., septic tank seepage fields, sand and gravel sources, camp sites, road building material, ponds or reservoirs.

The interpretations made do not eliminate the need for on-site sampling and testing for design criteria, however, the interpretations do indicate which sites are most likely to be favorable for a planned structure or use and which sites have severe limitations. This type of information can be basic input for a preliminary land use plan or zoning map.

One of the most perplexing problems in regional planning, and one about which there is little understanding or agreement on the part of planners, is the adaptation of the soils information to the varying scales or levels of study. Obviously, in light of the great variation (change in soil type from one location to another) and variability (change of the same soil due to climatic or seasonal change), the soil factor must be approached through appropriate categorical-cartographical units. Large geographical areas lend themselves to consideration at the great soil group. This level of classification is limited to studies where little detail is essential. Attempts to apply the great soil group category or general soils category to planning studies always leaves much to be desired. In regional planning studies, the investigator must approach the soils picture through the lower categories of soil classification. The soil series generally provide very appropriate units of consideration, but if minute detail is pertinent or where soils are extremely complex, the soil association, the catena, the toposequence, or the type may provide more significant soil information.

Conclusions

Proper evaluation of physical geography in regional planning requires careful consideration of the role of the soil and the underlying geologic structure. There is a strong tendency for the roles to change with specific landscapes and specific land use proposals. In many cases, a given landscape characteristic may result primarily from the impact of a single soil. Often the dominant soil may be of small areal extent, yet sufficiently pertinent to give character to the geographic complex.

Mounting pressures upon land, which are fundamentally a result of population growth and technological change, are constantly making soil (land) more and more valuable and forcing planners to look not only at how soils can be used, but, more importantly, how they can best be used.

The pedological soil classification system provides the planner with a broad concept of the physical environment, as well as, the soil with which he is dealing, rather than an isolated concept which is obtained by sampling and analyzing soil in a disturbed state at a particular test site. Soil interpretation is the most systematic approach to understanding landforms and their composition because it provides the planner with a most reasonable representation of subsurface conditions prior to excavation. It also enables planners to visualize corrective measures that may be necessary to provide the most practical and economical solution to soil problems.

It should be made clear that, in considering the constraints placed on development by soil conditions, almost any site can be made suitable for almost any purpose. However, site preparation and engineering costs vary from practically nothing on suitable soils to huge amounts on unsuitable soils. Although only one part of total development costs, extensive site preparation costs can require a significant outlay of capital for adapting development to unsuitable soils. The problem may manifest itself in the future in even more costly ways. The financial hardship on an individual owner in such an occurrence is obvious.

Although the land use recommendation for any piece of land is influenced strongly by the characteristics of the soil, these characteristics themselves alone do not determine the planning or development recommendation. In addition to economic sociologic and other criteria, the soil conditions provide another factor for determining a satisfactory and efficient pattern of land use.

ECONOMIC GEOLOGY AND STRATIGRAPHY OF STARK COUNTY

Jim L. Jackson

The products of mineral industries in Stark County include cement, coal, clay, sand and gravel, stone, peat, gas, and oil. The value of these products totalled $11,476,677 ($709,520 oil and gas) in 1960. (DeLong, 1963). This figure does not include the employment benefits provided by these industries to persons in Stark County both directly and indirectly through goods and services required by mineral industry employees.

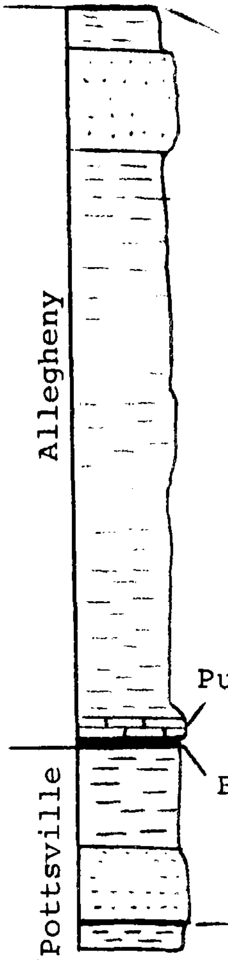
Oil and Gas Production

A considerable part of the field trip traverses the East Canton-Magnolia Oil Field. The East Canton Field was opened in 1947. Henry S. Belden, III, estimated the potential before tax profit for the field at $248,125,000 based on 5,000 producing wells, 250,000,000 barrels ($3.07/barrel) recoverable and 250,000,000 MCF of gas. In 1968 there were about 10,000 barrels per day being sold from 300 wells. There 128 wells completed in Osnaburg Township in 1968 with a total of 402 completion reports for wells in 1968 (Sitler, Jr., 1968 or 1969).

Most of the production is from the Clinton sandstone, actually sandstones interbedded with shales within the Albion Group of Lower Silurian Age. Net sand is 30-90 ft. of a 50-140 ft. interval. (Sitler, Jr.). Low permeability is common. Fracturing is required. The wells average about 5,000 ft. in depth.

Coal and Clay Production

Recent figures for coal production by selected counties and total for the State of Ohio are given on page 22. Stark County coal production is from the Brookville (No. 4), the Lower Kittanning (No. 5), and the Middle Kittanning (No. 6) coals. Small amounts from other coals have been mined. Near Massillon the Sharon (No. 1) was mined several years ago. Estimated reserves of the No. 4, 5, 6 coals totalled approximately 620,000,000 tons in 1963. Over 2,000,000 worth of coal was sold in 1960. (DeLong, 1963).



Stark County was second among the counties of Ohio in clay production in 1960 with a total production of 416,137 tons. Blending of clays is common. The Lower Kittanning Clay (No. 5) provides the greater amounts with the Upper Freeport (No. 7), the Middle Kittanning (No. 6), the Brookville (No. 4), the Tionesta (No. 3b), and Flint Ridge Clays. The Tionesta clay is used extensively by the U.S. Ceramic Company in East Sparta.

The Clarion Shale is the most valuable of the shales and is utilized by the ceramic and cement industries. (DeLong, 1963). Note the foldout on page 18 of the stratigraphy along I77 north of the Stark Tuscarawas boundary. The sketch was prepared under the direction of Dr. James W. Teeter.

Section at left is from the U. S. Ceramic Co. Quarry in East Sparta.

0 40
scale in feet

Limestone and Miscellaneous

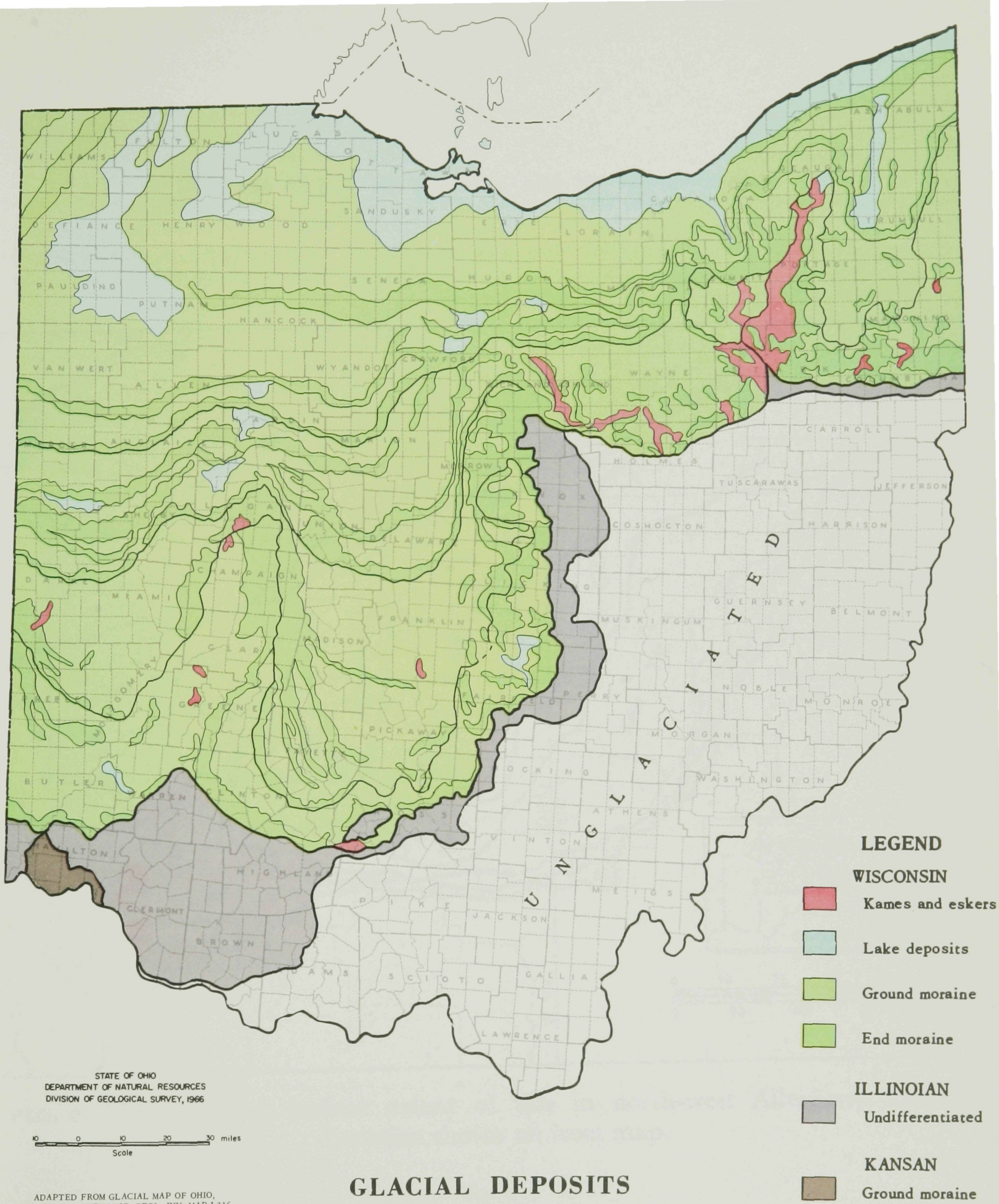
Seven hundred seven thousand and eight hundred ninety three tons of limestone were produced in Stark County in 1959. Of this amount, 518,870 tons were processed for cement. The Putnam Hill Limestone is the major source of limestone in Stark County. The Putnam Hill is a marine limestone. It is quarried near Middlebranch and is exposed in several parts of the county including the U.S. Ceramic Quarry in East Sparta. (DeLong, 1963).

Salt is known to underly Stark County between 3,000 and 4,000 ft. below the surface. It has not been mined.

Stark County ranked fifth among the Ohio counties in sand and gravel production in 1960. (DeLong, 1963). Gravel in Stark County typically has less shale and is a more desirable aggregate than gravel found North of Stark County. Nearly all the sand and gravel is from Pleistocene outwash and kames.

Sandstone was quarried in the past, but this has been abandoned for some time.

Stark County ranked second among the counties in peat production for lawn conditioning in 1960. (DeLong, 1963).



GLACIAL DEPOSITS OF OHIO

Surface Tills of NE Ohio and NW Pennsylvania

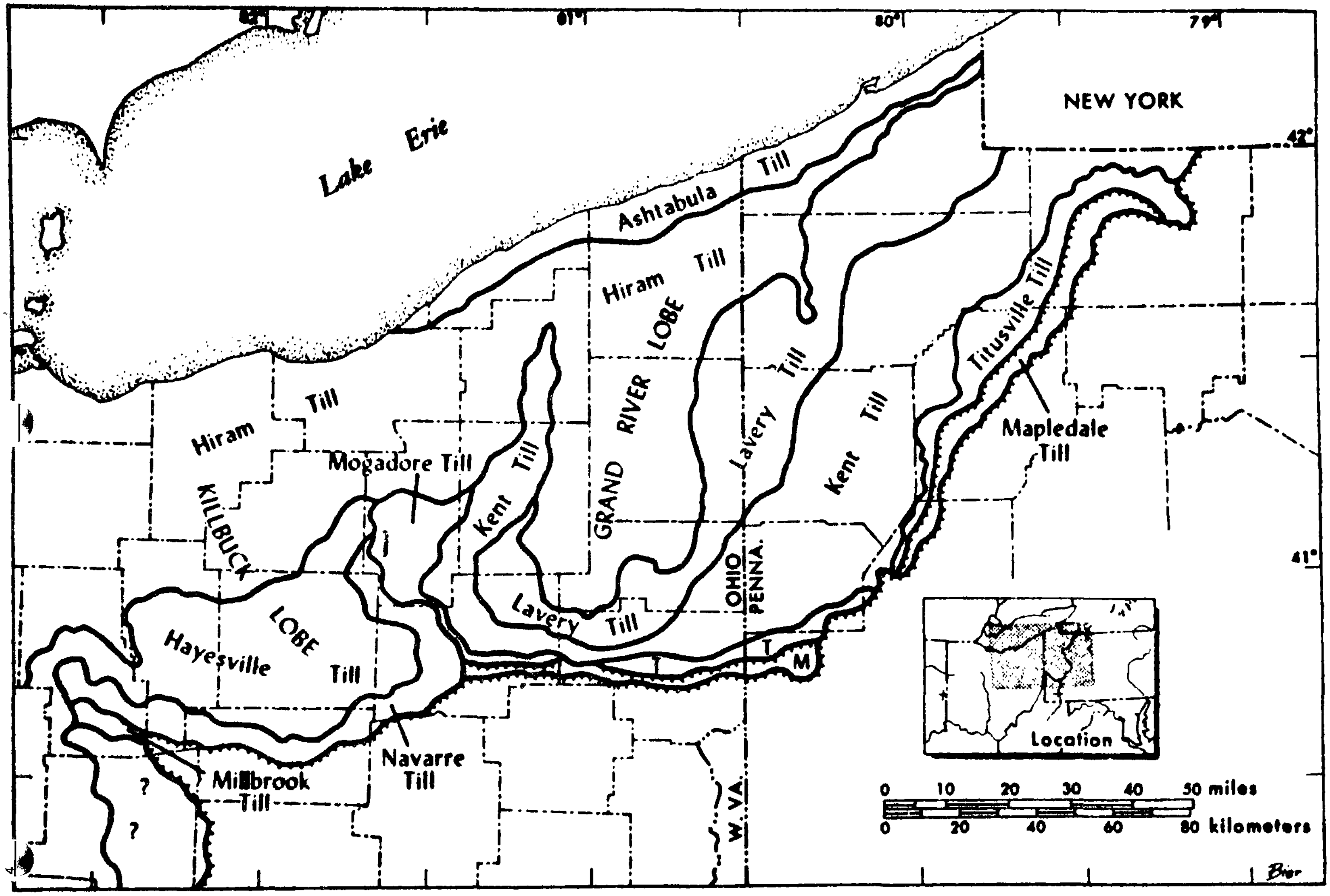


FIG. 2. Map showing surface extent of tills in north-west Allegheny Plateau. Location shown on inset map.

George White, 1969

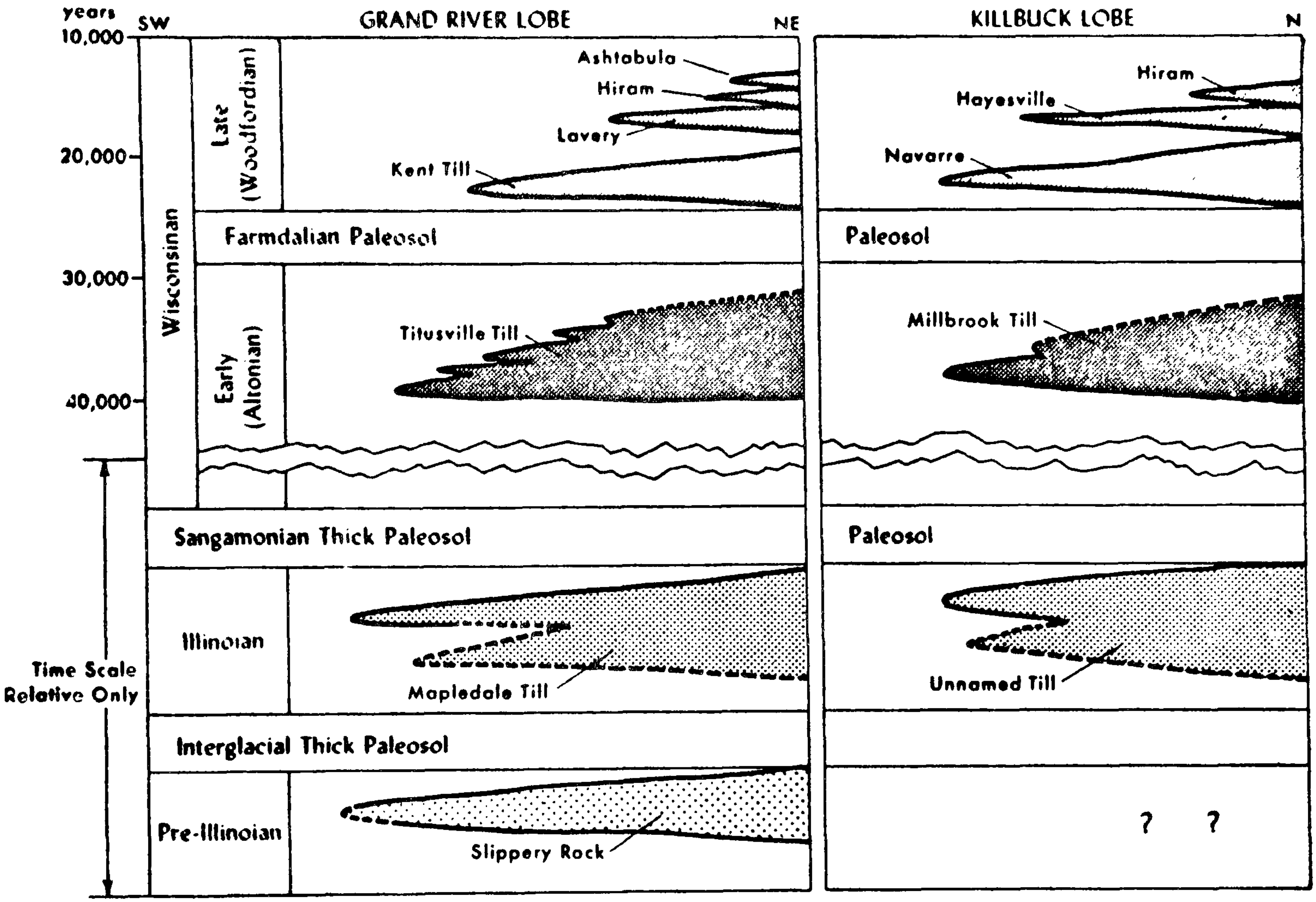
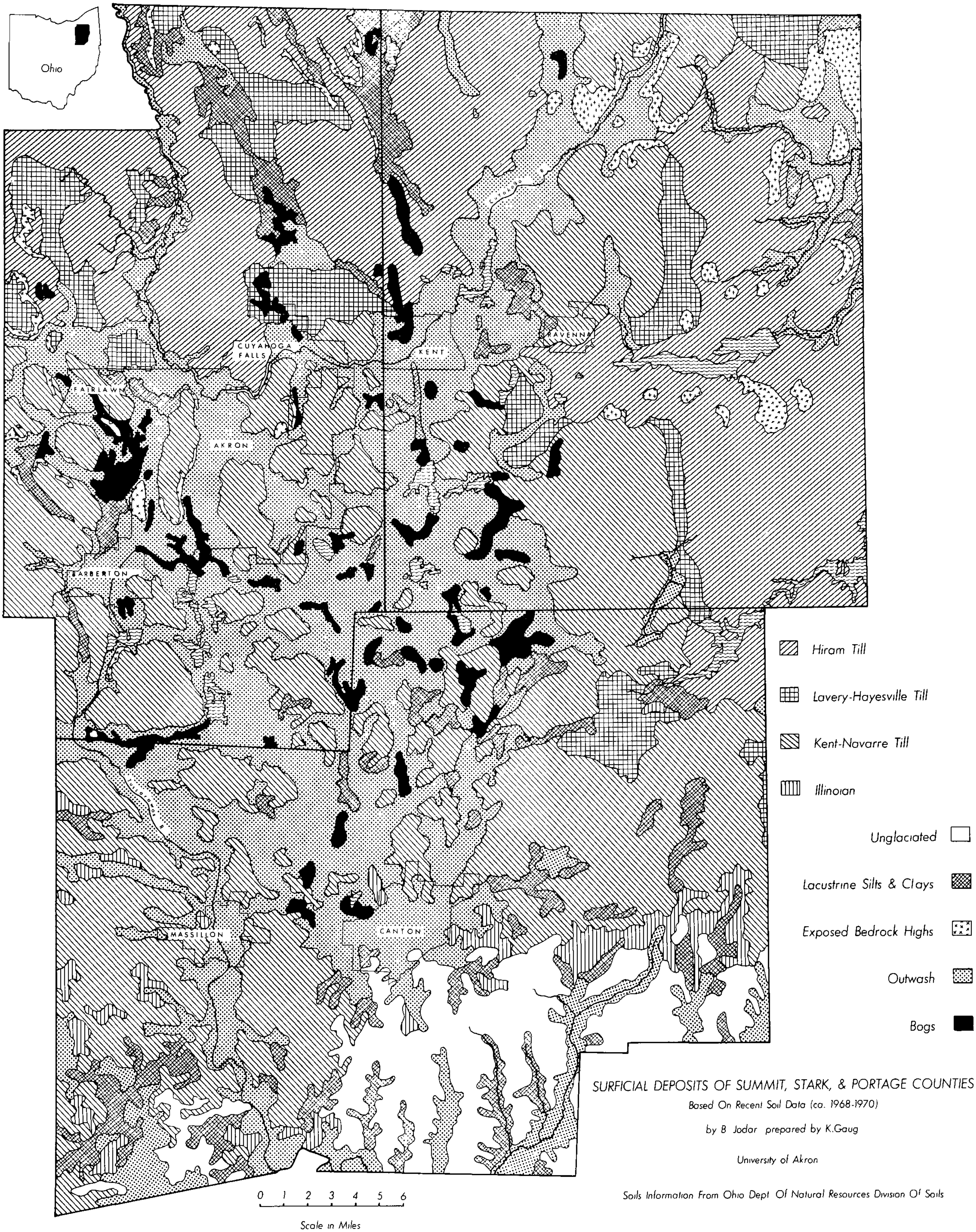


FIG. 3. Time–space diagram showing stratigraphical position, extent and age of tills in Grand River lobe in Ohio and Pennsylvania and Killbuck lobe in Ohio. Thickness of 'wedge' for each till represents estimated time duration, not relative till thickness. From Lake Erie to glacial boundary is about 65 miles in each diagram.



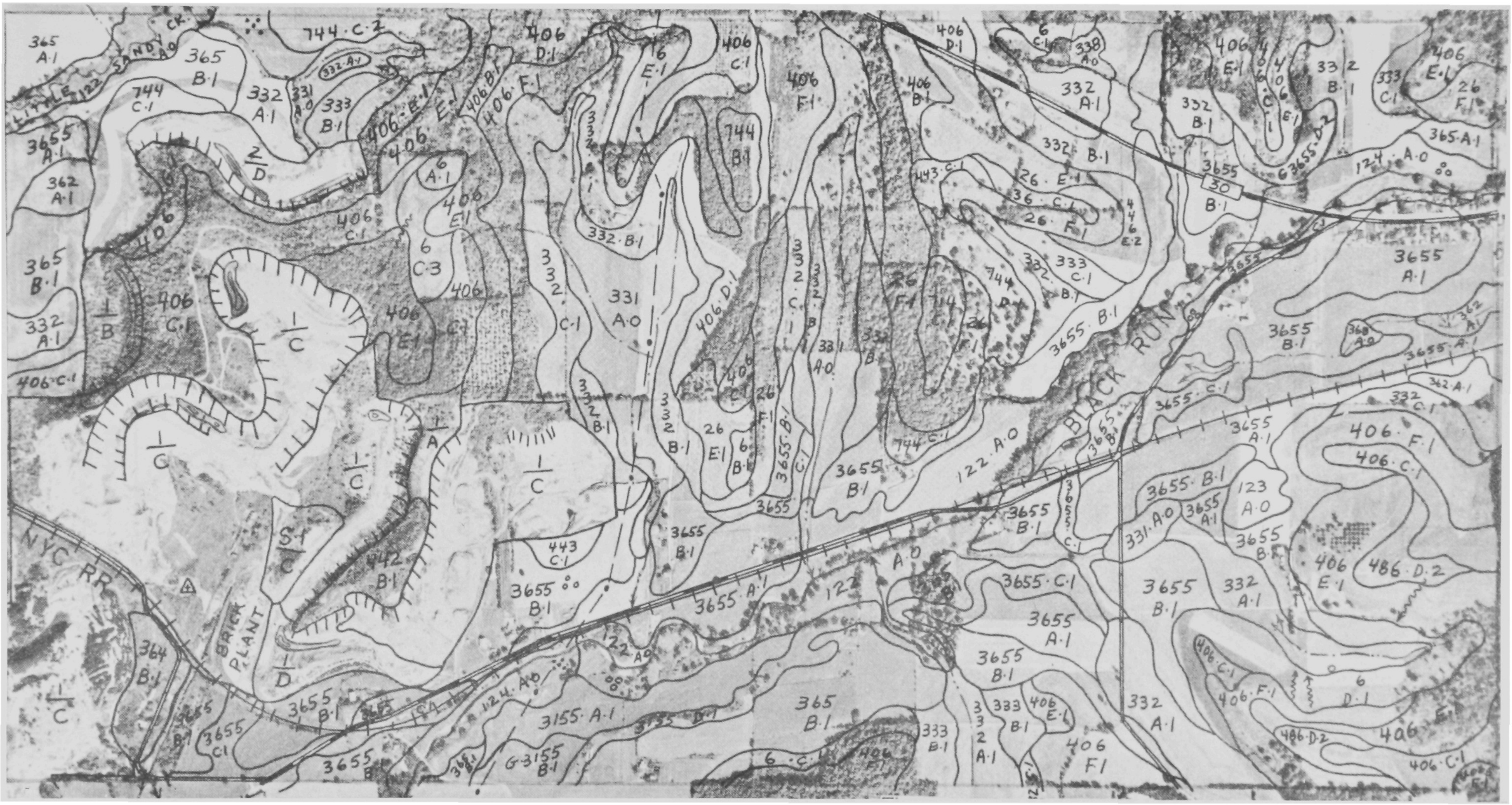
SURFICIAL DEPOSITS OF SUMMIT, STARK, & PORTAGE COUNTIES

Based On Recent Soil Data (ca. 1968-1970)

by B Jodar prepared by K.Gaug

University of Akron

Soils Information From Ohio Dept Of Natural Resources Division Of Soils



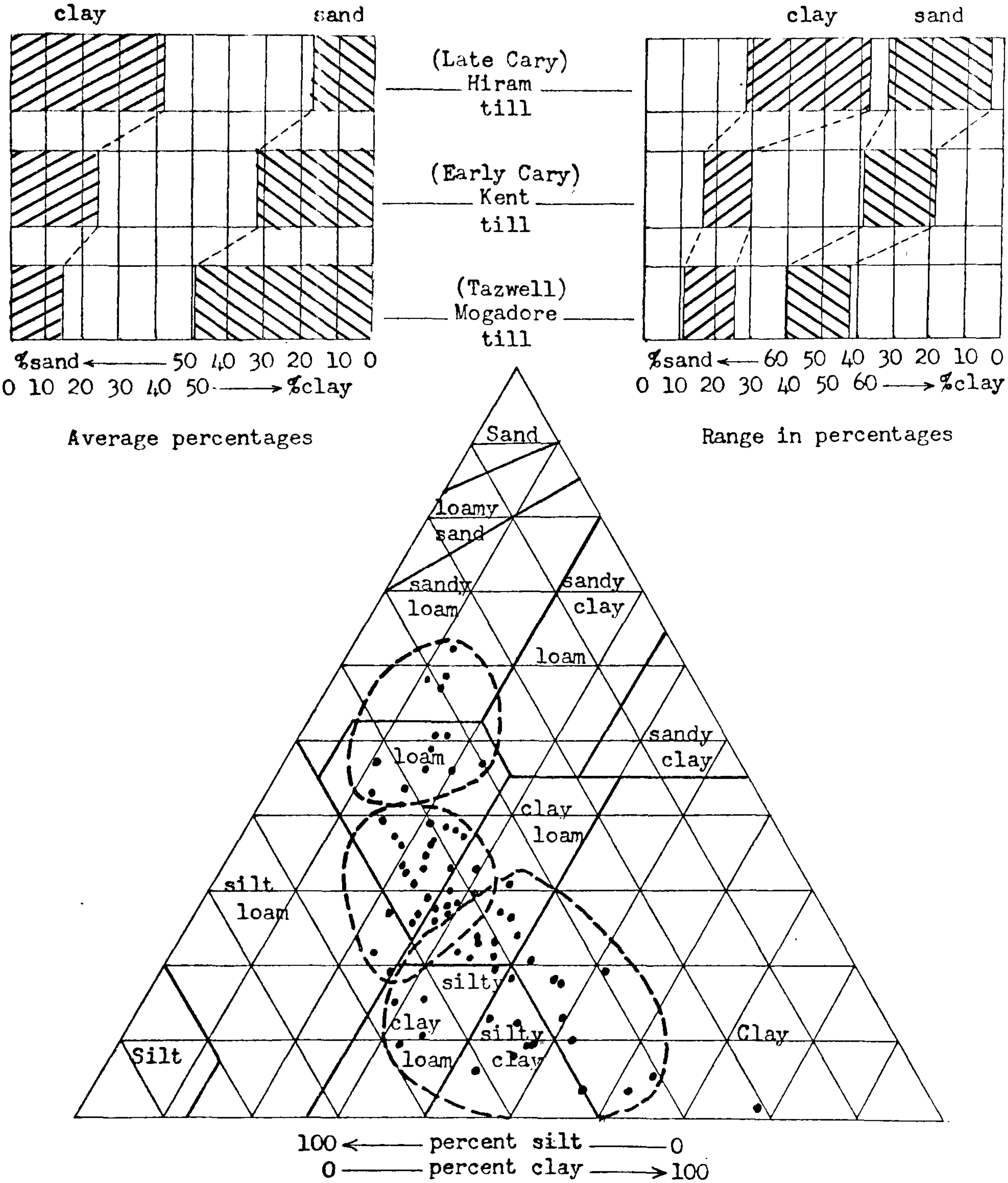
Detailed soils map: Stark County, Ohio 2V-158. The preparation of this map was financially aided through a Federal grant from the Urban Renewal Administration of the Housing and Home Finance Agency, under the Urban Planning Assistance Program authorized by Section 701 of the Housing Act of 1954, as amended.

V. C. Shepps'

Correlation of Northeastern Ohio Tills

by Size Analysis

1953

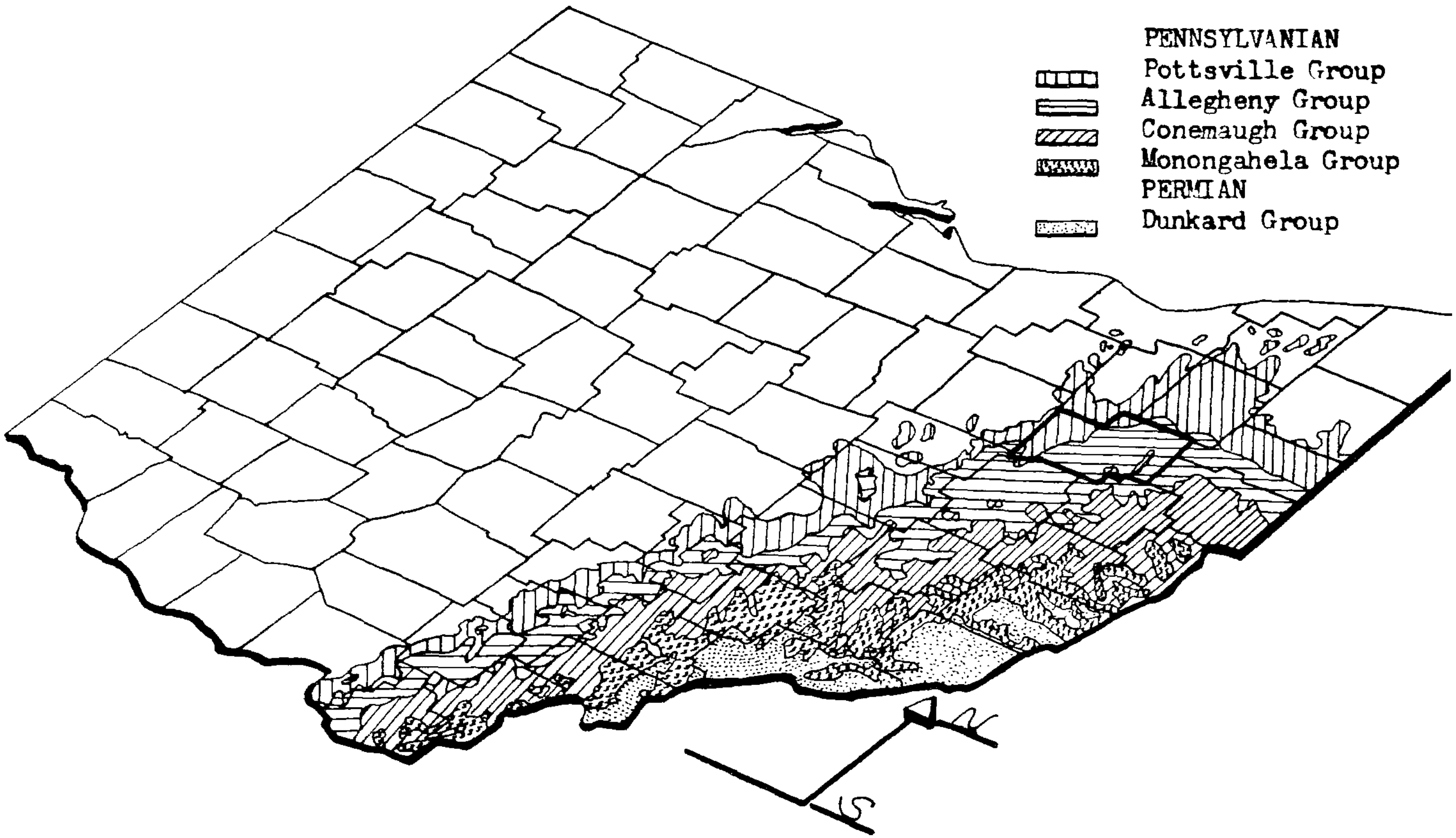


Composition of 76 till samples from three tills in northeastern Ohio.

SEQUENCE OF CYCLOTHEMS - SOUTHERN STARK COUNTY

THE COAL-BEARING GROUPS OF OHIO.

Stark County, ranking thirteenth among the coal producing counties in Ohio in 1960, is outlined in the northeast section of the state. Production totaled 614,977 tons from the Brookville, Lower Kittanning, and Middle Kittanning coal beds.



GENERALIZED STRATIGRAPHIC SEQUENCE OF STARK CO.

Period	Group*	Member	Description	Thickness
Quaternary			Glacial till, leached	5'8"
			leached and oxidized	12'
			total	21'
Pennsylvanian	Conemaugh	Lower Mahoning	Shaly, thin-bedded, conglomeratic, channel-filled sandstone	20' to 130'
		Upper Freeport	(No. 7) coal, variable	2'
			Clay	4'
	Allegheny	Upper Freeport	Ls., discontinuous	3'
		Bolivar	Coal and clay, thin, discon.	3"
		Shawnee	Ls., thin, discon.	4"
		Upper Freeport	Shale, and sandstone	60'
		Dorr Run	Shale, marine, local	6"
		Lower Freeport	(No. 6a) coal, thin	10"
			Clay	3'6"
		Lower Freeport	Ls., nodular to bedded	1'7"
		Lower Freeport	Shale and sandstone	50'
		Upper Kittanning	Coal and clay, local	2"
			Shale	23'
		Washingtonville	Shale, marine, nodules	10"
		Middle Kittanning	(No. 6) coal, good	2'4"
			Clay, plastic	6'
		Leetonia	Siderite, nodular	6"
			Coal, thin, local	1"
		Middle Kittanning	Shale	17'
		Strasburg	(No. 5a) coal, thin, local	9"
		Oak Hill	Clay, siliceous	6"
		Strasburg	Shale, dark, concretions	11'
		Columbiana	Shale, marine, ls. nodules	1'2"
		Lower Kittanning	(No. 5) coal, good	2'
			Clay, plastic	6'
		Lawrence	Coal and clay, very local	2"
			Shale	16'
		Vanport	Ls., marine, discon.	8'
		Clarion	Shale	50'
		Putnam Hill	Ls., marine shale	10'
		Brookville	(No. 4) coal, good	2'
	Pottsville	Brookville	Clay	4'
		Homewood	Shale and channel-fill ss.	25'
		Tionesta	(No. 3b) coal, discon.	6"
			Clay, local, plastic	8'
			Shale, sandy	10'
		Upper Mercer	Ls., marine, dark, dense	2'
		Bedford	Coal, irregular	1'6"
			Clay, plastic	1'6"
			Shale, soft	23'
		Lower Mercer	Ls., marine, dark, dense	2'6"

(continued next page)

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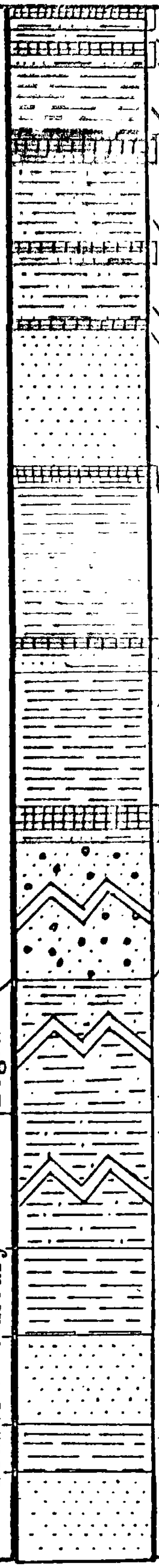


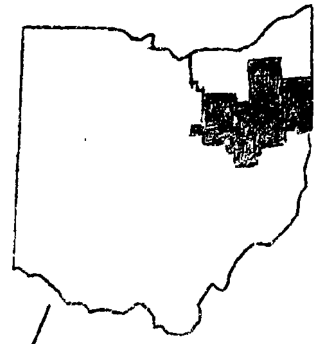
Period	Group*	Member	Description	Thickness
Pennsylvanian	Pottsville	Middle Mercer	Coal, irregular	1'6"
			Clay, plastic	2'
			Shale, fine-grn. ss., inclu.	15'
		Flint Ridge	Coal, bright, blocky	1'
			Clay, silty, carbonaceous	2'5"
			Shale, carbonaceous	15'
		Boggs	Ls., dense, marine, irreg.	2'
		Lower Mercer	(No. 3) coal, bony	6"
			Clay, gray, plastic	3'
			Shale, silty	18'
		Vandusen	Coal, thin	6"
			Clay, siliceous	7"
			Shale, silty, ss.	14'
		Bear Run	Coal, thin	3"
		Massillon	Ss., channel-fill, or shale	30'
		Quakertown	(No. 2) coal, persist., thi	1'
			Clay	?
			Shale, siliceous	14'
		Anthony	Coal, smut, discon.	2"
		Sciotoville	Clay, plastic, siliceous	5'
			Shale	30'
		Sharon	(No. 1) coal, lenticular	5'
			Clay	?
		Sharon	Conglomerate, ss.	100'
Mississippian	Logan		Shale, grey, silty, carbon., Ss., fine-grn., low porosity	300' to 400'
	Cuyahoga			
		Sunbury	Shale, dk. grey, carbon., with pyrite	16' to 95'
	Berea		Ss., med.-fine grn., mica.	10' to 100'
		Bedford	Shale, lgt.-med. grey, silty	2' to 10'
	Cussewago		Ss., loosely cemented	20'

KG

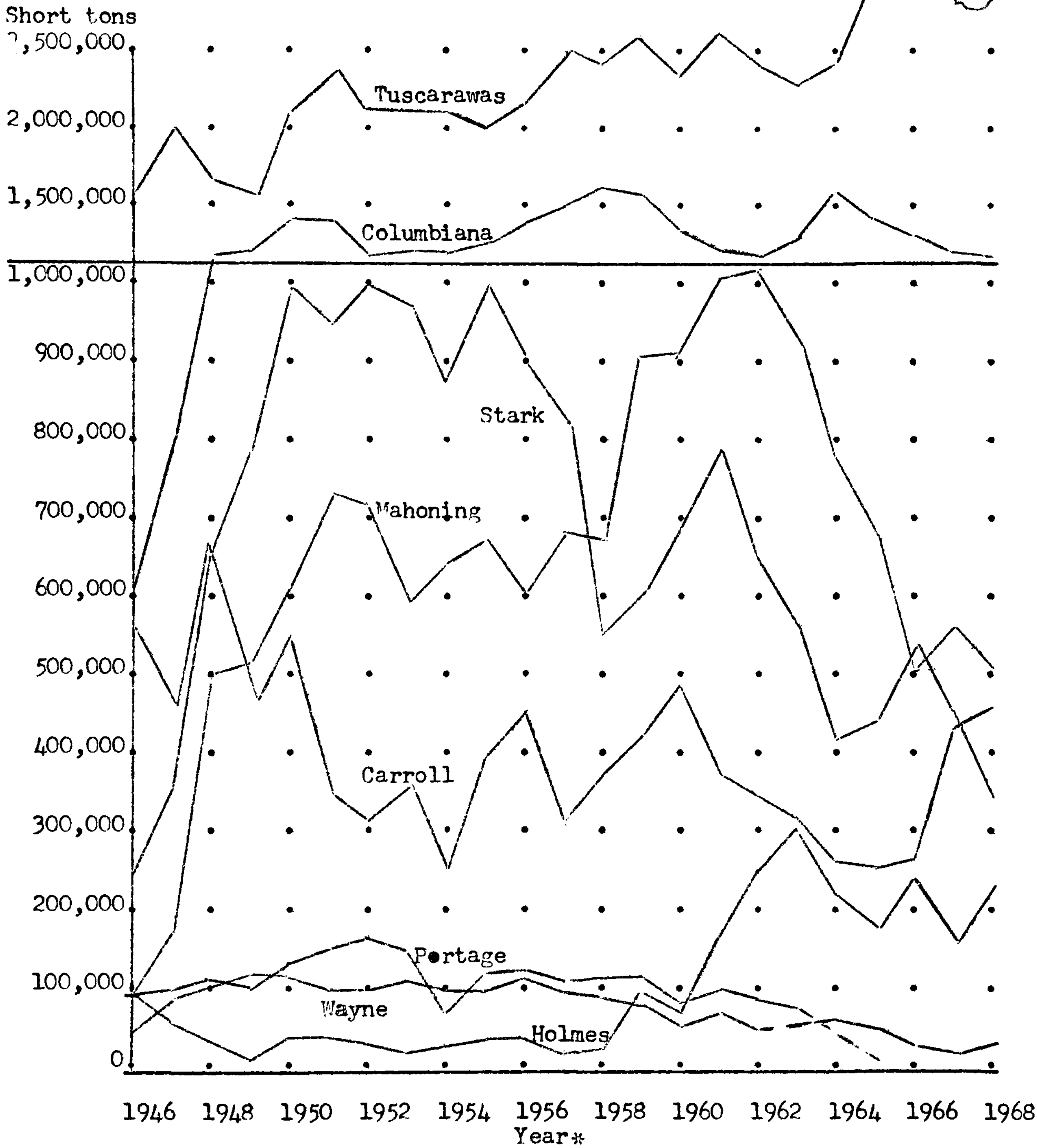
* following The Ohio Division of Geological Survey, bulletin number 61, The Geology of Stark County, by Delong and White.

Total Coal Production by County 1946-1968

in Northeastern Ohio



[Total for State in 1968--48,323,000 tons; 8.31% of U.S. Production. County with greatest production (1968) Harrison, with 10,532,000 tons].



* 1958-1968 data from Minerals Yearbook by the U.S. Dept. of the Interior.

\- - - - means information was withheld.

Road Long

OHIO ACADEMY OF SCIENCE
Geology Field Trip
April 24, 1971.

Mileage	
0.0	--Out of lot-University of Akron and East on Carrol St. to Market St. to Rt. 261 East toward Tallmadge. After crossing the R.R. tracks continue uphill, landfill is
1.6	on the left.
2.0	--left (sharp) onto Eastwood
2.1	--Entrance Akron Landfill and Waste - Stop # 1. Sanitary Landfill in abandoned sand and gravel quarry. Pleistocene (Wisconsin) outwash and lacustrine deposits are exposed.
0.0	--Leave Stop # 1, travel East on Rt. 261 to Brittain Rd. Continue due East through the intersection (leave Rt. 261).
2.2	--Water tower on the right.
3.2	--State Route 91--turn right.
3.8	-- turn left on Gilchrist Road to Interstate 80S and travel East.
4.2	--onto Interstate 80S East-bound. -Road cuts through bedrock -sodded over -Pennsylvanian-sandy shale
7.3	--Small Kettle hole on right -kame and kettle topography of the Kent End Moraine
8.0	--off Interstate 80S to County Highway 18-turn right
8.4	--R.R. and creek-scenic golf course, "Sunny Hills" recreation area -kame and kettle topography
9.5	--rolling natural hills-Green Hills Golf Course-Kent End Moraine
9.8	--Turn right on St. Route 43 (See Portage County Log)
14.8	--St. Rt. 43 and U. S. 224 intersection, Suffield
17.4	--Monarch Plant 2
17.6	--Stark County line

19.0	--Enter Hartville
19.3	--St. Rt. 619-Turn Left
19.8	--Turn left at The Pantry
20.3	--Turn Right on Swamp Road
21.2	--Edge of "Big Muck"
21.6	--Turn left -Migratory labor housing
21.9	--Drainage Ditch -Day Care Center
22.5	--Pinedale-Turn Right
23.2	--Washing facility for vegetables.
23.6	--Cross Tope Ave.
24.7	--Stop # 2-Chili-Carlisle -Soils of the Glen Graber Farm on the south side of the road
0.0	--Retrace route one mile
1.0	--Turn left (South on Tope Ave.)
2.0	--Turn right (West) on Swamp Rd. -Drainage on South side of road is to the Ohio River, on the North Side the drainage is to Lake Erie. --Cross Major Ditch
3.0	--Turn Left (South) on Duquette Ave.
4.0	--Turn Left (East) on St. Rt. 619
6.6	--Cross St. Rt. 44 - East on St. Rt. 619
8.6	--Marlboro Center procede East on St. Rt. 619
9.9	--Turn Left on Lair Road
11.6	--Crossroad - GO STRAIGHT
12.2	--Stop # 3 Canfield Soil at strip mine
0.0	--Continue North on Lair Road
0.3	--Turn Right on Greenbower Street
1.2	--Cross Atwater Ave.-Continue East
1.6	--Note stripping for Bedford Coal on Right
1.9	--Cross State Rt. 183 (Iowa Ave.) - Continue East -Part of Berlin Reservoir on the left beyond R.R.

3.6 --Cross Union Ave. (Rt. 225)

4.8 --Stop # 4 - Turn onto Cinder Road to Remsen soil site
0.0 -Leave Stop #4-Retrace to State Route 225 (Union Ave.)

1.3 --Turn Left - Drive to Alliance

3.4 --Alliance City Limits St. Rt. 225 merges with St. Rt. 183

5.4 --Mount Union Campus on the right

5.7 --Cross St. Rt. 62 - Contine South on St. Rt. 183

6.4 --Turn left into Silver Park (lunch)

0.0 --Back to St. Rt. 183 turn left (South)

2.4 --Turn Right (West) at Cenfield St. crossing major water divide Lake Erie and Ohio River

3.8 --Turn left (South) onto Beechwood Ave.

5.8 --Freeburg, turn right (West) on St. Rt. 153.

6.8 --Colors of Flood plain soils might be noted if the spring plowing has occurred.

7.7 --Turn on Paris Ave. - Cider Mill

9.7 --Turn to Autumi Ave. at Bain

10.3 --Turn Left on St. Rt. 172 - Wisconsin outwash (Valley train deposits) in Black Run valley.

10.5 --Turn Right on Robertsville Road
-(Strip mine-activity small cut)
-outwash terrace (Wisconsin)
-road itself constructed on terrace

13.0 --Undercut bank-shale-sandy on the right.

13.1 --Turn right on U.S. 30 in Robertsville.
-Note the detailed Soils Map, p. 16. The map includes the next two miles of the route. At approximately the center of the map is supposed to be some Illinoian outwash. The recent soils survey did not support the earlier glacial mapping. It is possible to say that you almost saw some Illinoian outwash on this trip.

13.2 --Turn left before bridge on Mapleton St. Terraces in the valley train deposit can be readily seen.

14.1 --Cross R.R. tracks

14.3 --Cross R.R. tracks again

15.0 --Strip mining and high wall to the Northwest.

15.1 --Sharp left over R.R. tracks just beyong prominent high wall onto Weimer Drive.

16.4 --Turn on Hein Ave.

17.4 --Stop # 5 on Hein Ave. Typical soils on bedrock highs south of the glacial boundary

0.1 --Turn right on Hill Church Road
-Fossil fuels are still being removed from this area
-Note the brief description of oil, gas, and coal production on page 10.
-This is part of the East Canton-Magnolia Field. The Silurian "Clinton Sand" is the producing horizon.

2.0 --Turn left onto Ravenna Road St. Rt. 44

2.8 --Reclaimed land-Tree planting

3.7 --Active coal mining

3.8 --Natural gas and oil storage and "grasshoppers"
4.8 --Strip mining-both sides of road
4.9 --Near Waynesburg
-Outwash visible from the bus was mapped as Wisconsin by White.
5.5 --Junction St. Rt. 43 and St. Rt 44
-Junction with St. Rt. 183 -continues with St. Rt. 44
6.0 --Sandy Creek and Waynesburg
6.4 --Traffic light-Turn right on St. Rt. 183
7.3 --Outwash--Ill. age ?
7.5 --Outwash terrace - Wisconsin age
8.1 --Magnolia Limits
9.0 --Turn right off St. Rt. 183 - onto Main St.
9.5 --Turn left on Westbrook
-Oil Storage Tanks
11.2 --Cross Bowmant Ave.
12.0 --East Sparta
12.3 --Turn South (left) toward water tower over Nimishillen Creek
12.8 --Town pump of East Sparta -turn right
12.9 --Turn left - Chestnut Street
13.2 --U. S. Ceramic Co. Quarry is to the West.
-Note the Guidebook cover and page 11.

13.4 --Stop # 6
-Back entrance to "Yellow Brick Road". Mr. Dan
-Cavanaugh, Plant Superintendent, will escort us to the quarry.

0.0 --Return to Akron
-Back onto Chestnut St. - going north retrace path to Town pump
-Turn North to St. Rt. 800 to I77 to Buchtel Ave. and Student parking Lot, the U. of Akron.
-Thanks for coming and have a safe trip home.

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